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GEOLOGICAL STRUCTURE AT STANLEIGH MINE IN ELLIOT LAKE - PROGRESS REPORT

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ELLIOT LAKE LABORATORY

FEBRUARY 1983

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MINERALS RESEARCH PROGRAM
MINING RESEARCH LABORATORIES
DIVISION REPORT MRP/MRL 83-22(TR)

27pp

GEOLOGICAL STRUCTURE AT STANLEIGH MINE IN ELLIOT LAKE - PROGRESS REPORT

by

B. Arjang*

ABSTRACT

At the Stanleigh Mine 387 m (1240 ft.) of new workings were mapped, resulting in the measurement of 296 structural discontinuities. The structural features are briefly described and the discontinuity data were analysed by stereographic projection. Analysis of mean orientation and spacing showed the following:

	Orientation (dip direction/dip)	Spacing m (ft.)
Bedding:	190°/10°	
Dominant Joints (ENE):	025°/75°,205°/70°	2.02 (6.7)
NS-Joints:	100°/70°	14.00 (46)
Shallow Joints (Bedding sub-parallel):	030°/20°	17.00 (56)

To provide a better appreciation of the structural features of the mine, additional data collection and measurements are required. Further investigation could be done in conjunction with characterization of rock mass and possibly in situ stress determination.

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INTRODUCTION

The objective of this preliminary study was a general assessment of the geological structure at the Stanleigh Mine, Rio Algom Ltd. For this purpose a survey of the new working area, the crosscuts 37051, 3603 and 3717 (total length of 387 m (1240 ft)) was conducted and mapped in detail (Fig. 1). These drifts cut across the rock sequence of the ore bearing zone.

A total of 296 structural discontinuities, i.e., joints, dykes and faults of all extent were measured and identified by stereographic projection (Schmidt-Equal-Area Net, lower hemisphere). Discontinuity data were represented in mapping sheets (Appendix). The description followed the Discodat Field Guide developed for the Pit Slope Manual (1).

MINE GEOLOGY

Stanleigh Mine is situated in the southern limb of the Quirke Lake syncline. At the mine site, a rock sequence of thick layered quartzite and massive quartz-pebble conglomerate strikes nearly EW (N100°E), dipping 10° towards north. Mineralization occurs in conglomerates, and three continuous conglomerate reefs, the Lower, Main and Upper reef have been identified throughout the mine. Figure 2 shows the ore bearing section.

The rock sequence of the ore bearing zone is cut by various easterly (N95°-115°E) striking and steeply dipping dykes. The diabase or lamporphyre dykes range in thickness from 0.45 m (1.5 ft) to 2.7 m (9 ft) in the mapped area.

STRUCTURAL FEATURES

The joint concentration and distribution are shown on contoured stereoplot- and strike-frequency diagrams in Fig. 3. The orientation of

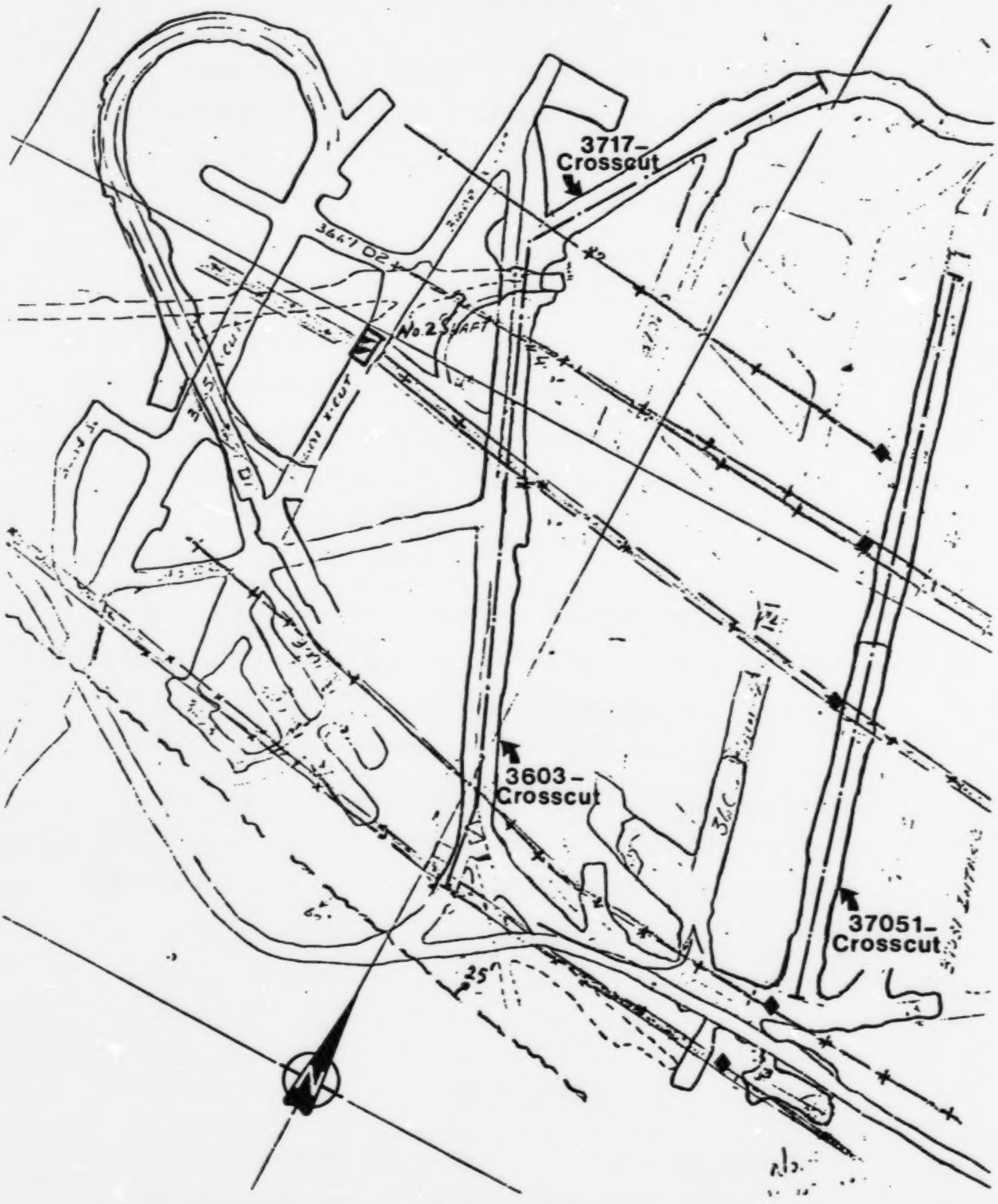


Fig. 1 - Stanleigh Mine layout and the location of crosscuts, (◆) dyke.

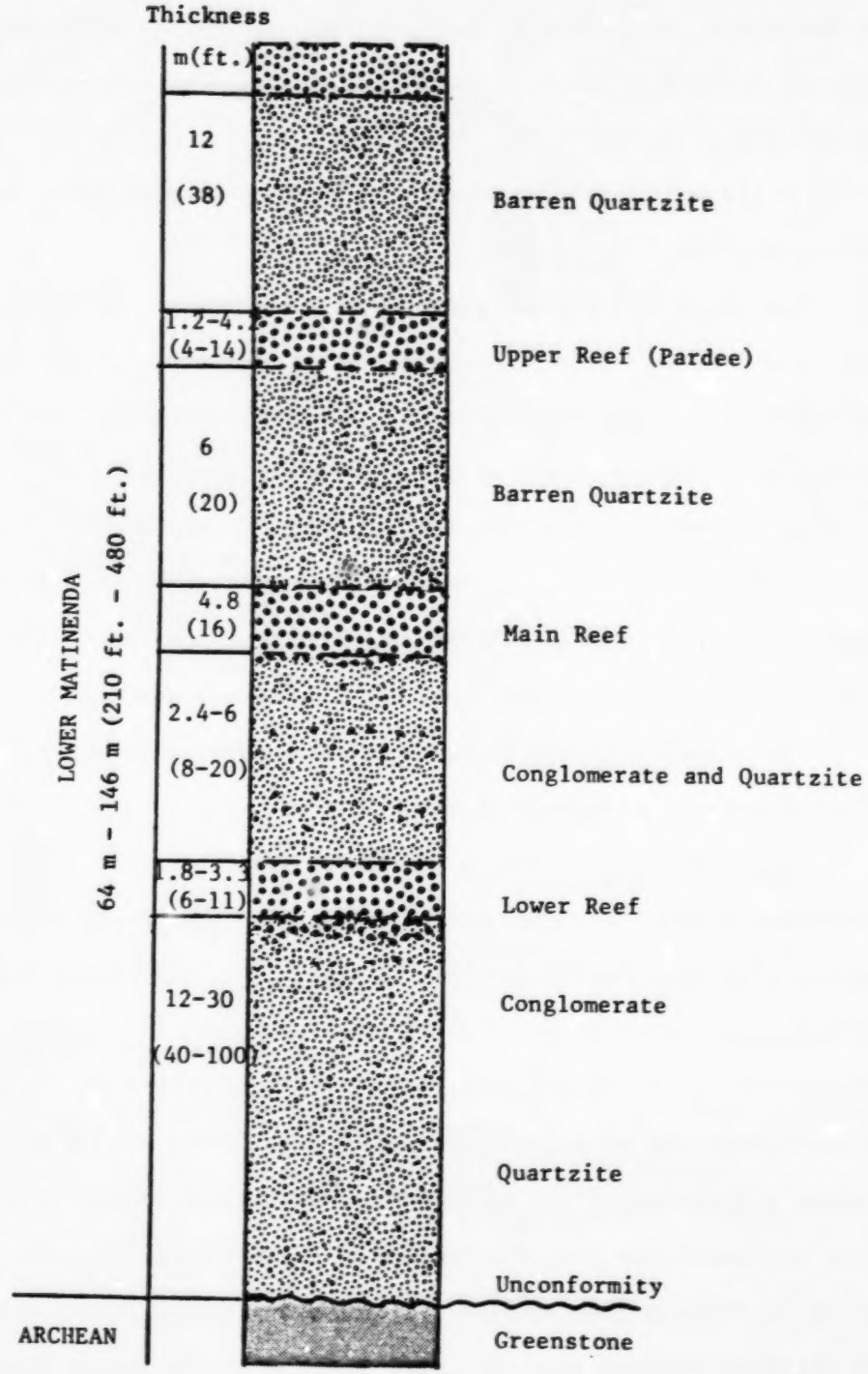


Fig. 2 - Generalized section of ore bearing zone at Stanleigh Mine.

major structures, their angular relationships and the direction of excavations mapped, are defined by means of great circles (Stereographic projection. upper hemisphere) in Fig. 4.

In the following, the results of analysis of structural features are briefly summarized.

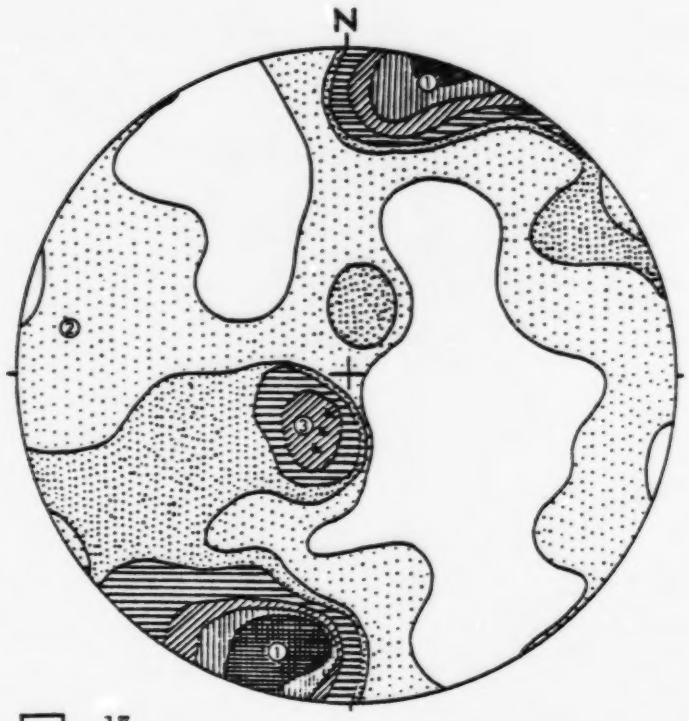
The trend of dominant joints is in a east-southeast direction, steeply dipping toward NE and/or SW. Thus, the dominant fracture planes act diagonally to the easterly oriented bedding plane. The east-southeast trend is also well pronounced on a regional scale at the Elliot Lake area (Fig. 5).

In the same trend as the dominant joints, some shallow dipping fractures (dip angle 10° to 35°) were observed. These were found to be sub-parallel to the bedding plane in some localities, and when well developed, they form horizontal slab-like structures along the hangingwall quartzite.

The steeply dipping, easterly oriented dykes and faults at the mine site correspond to the dominant joint direction.

Approximately NS trending joints are poorly exposed at the mapped area. Also fractures in northeasterly orientation are rarely observed, by comparison with the other section in the area, e.g., New Quirke Mine. The under-representation of NS and also NE trending joints is a result of the tectonic evolution in the southern limb of the Quirke Lake Syncline and can be documented geologically. In addition to this, factors such as observation only along a horizontal line, direction and/or limited dimension of excavations, may have influenced the limited exposure of these joints (in particular the NS-joints). Probably both shallow bedding sub-parallel joints and NS trending joints are more frequent than they were observed at the mapped area.

The dip angle of joint-planes ranges widely, but >70% dipped steeply between 90° to 60°.



1%
2%
3%
5%
7%
9%
12%
Bedding plane poles

Mean Orientation of Joints:
(dip direction/dip)

① Dominant Joints: 025°/75°, 205°/70°

② N-S Joints: 100°/70° ?

③ Shallow Joints: 030°/20°

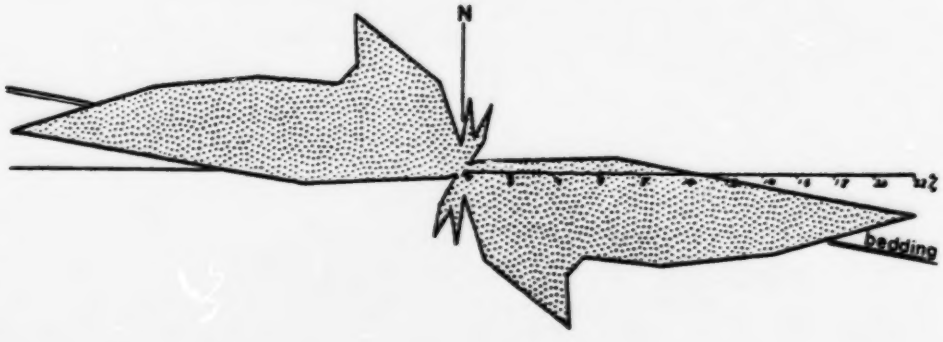


Fig. 3 - Stereoplot diagram of Stanleigh Mine, frequency contours in percent per 1% area for 296 observations, and strike-frequency diagram.

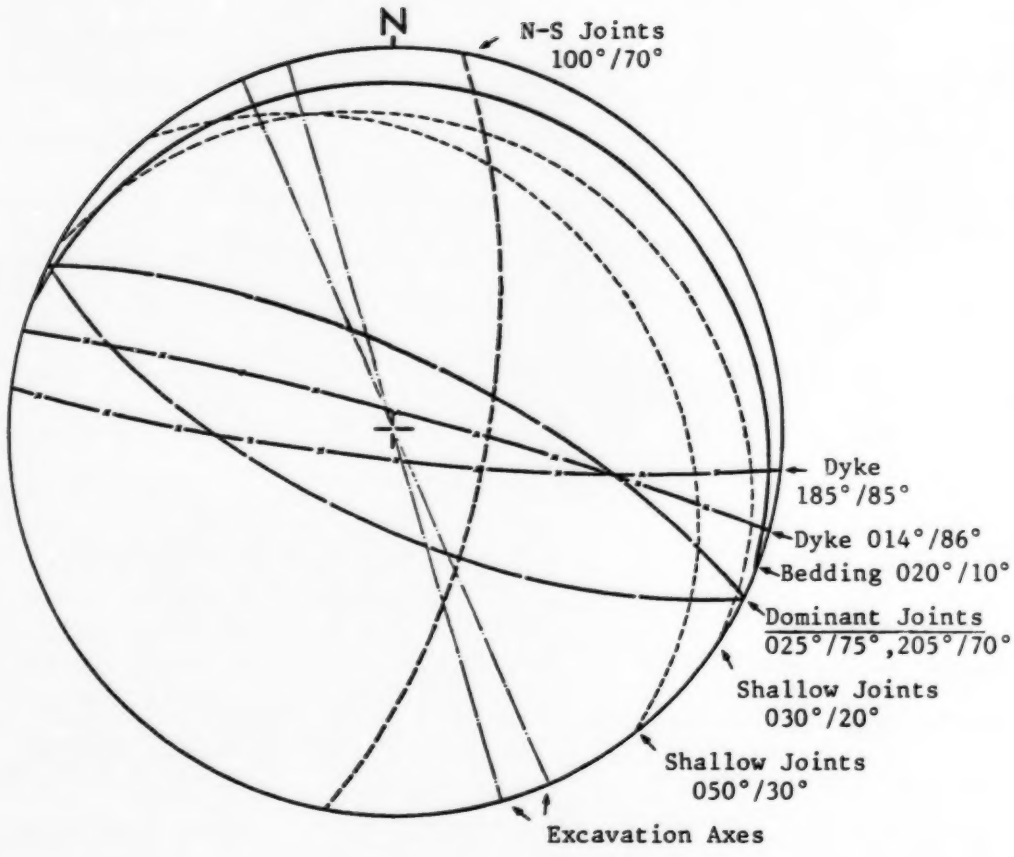


Fig. 4 - Angular relationships of major structural planes shown on great circles; Schmidt-Equal-Area Net, upper hemisphere (Dip direction/dip in degrees).

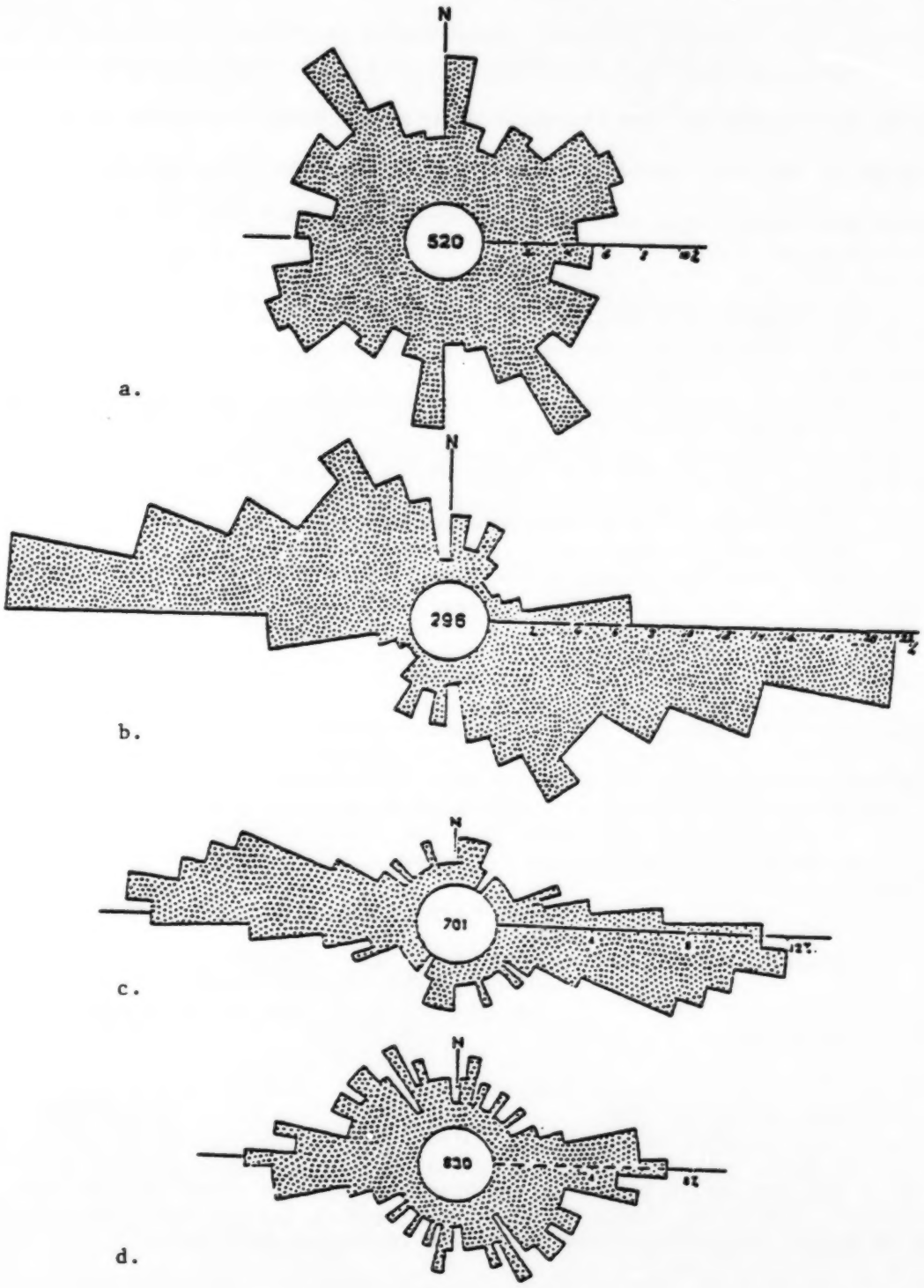


Fig. 5 - Strike frequency diagrams of joints; a) New Quirke Mine, b) Stanleigh Mine, c) Nordic Mine, d) Elliot Lake region (Diagrams c and d after Bielenstein and Eisbacher (2); the number of observations is indicated in each diagram).

The continuity and frequency of joints is dependent on lithological fabric, brittleness and the thickness of the rock mass. These can also be modified by the local tectonic intensity. At the mine site, the thick layered quartzose rocks were more frequently fractured than the massive conglomerates; the joint planes tend to extend and are more continuous. Only a small number of joints were found penetrating the contact between quartzite and conglomerate.

Dykes were intensely fractured and locally some striated surfaces were observed along the fracture and/or on the contact to quartzite. This indicates that the dykes were more affected by various movements.

The joints determined at the mine site commonly correspond to planar or "systematic" fractures and non-planar joints were rare. These were without remarkable apertures or "tight", with no unconsolidated infilling material or coating on the surface. Only a few joint planes exhibited waviness and roughness. Usually, the joint planes were unweathered, dry and hard.

Result averages and ranges of joint orientation and spacing are as follows:

	Dip direction/dip (°)	Spacing m (ft.)
Dominant Joints (ESE):	$\frac{025/75}{005\text{-}065/90\text{-}55}$, $\frac{205/70}{185\text{-}250/90\text{-}60}$	2.02 (6.7)
NS Joints:	$\frac{100/70}{090\text{-}130/87\text{-}50}$	14.00 (46)
Shallow Joints (ESE) (sub-parallel to bedding):	$\frac{030/20}{005\text{-}045/40\text{-}6}$	17.00 (56)

The spacing of joints at the Stanleigh mine is classified as very wide to wide; this corresponds to a solid to massive rock mass.

The apparent size or length of discontinuities obtained by estimating the largest extent in any direction in different size classes, and expressed

in percentage of total number of measurements, is given below:

45%: 0.6 - 2 m (2-6 ft)

35%: 2 - 6 m (6-20 ft)

17%: 6 - 20 m (20-60 ft)

3%: >20 m (>60 ft) - dykes and faults

This study is concerned principally with determination and analysis of joints, their characterization and spatial distribution. The current geological data and observations at the mine site were rather limited. Further investigations are essential in order to broaden the structural geological data base with the objective to identify the variability of the rock mass due to the occurrence of geological fracture and weakness planes. The results obtained from structural investigations would be useful for evaluation of ground conditions and a better selection of stress determination sites and interpretation or extrapolation of measurements.

The following studies could be carried out to obtain adequate results and to draw sensible conclusions:

- Additional structural mapping of excavations to obtain sufficient number of discontinuity data of hangingwall, ore body, footwall and basement rock exposure;
- Rock mass characterization; RQD test on drillholes in hangingwall;
- In situ stress measurements and determination.

ACKNOWLEDGEMENT

I wish to express gratitude to the management and personnel at Stanleigh Mine, Rio Algom Ltd. for their cooperation and assistance.

REFERENCES

1. Herget, G., "Pit Slope Manual, Chapter 2 - Structural Geology", CANMET Report 77-41, 123 p; 1977.

2. Bielenstein, H.U. and Eisbacher, G.H., "Tectonic interpretation of elastic-strain-recovery measurements at Elliot Lake, Ontario"; Mines Branch Research Report R210, October 1969.

APPENDIX - MAPPING SHEETS

KEY

Structural Feature

BG - Bedding plane

JN - Joint

FL - Fault ("NAM" = No appraisal movement)

ST - Striation

DK - Dyke

Rock Type (LTHLGY)

QRZ - Quartzite

CGM - Conglomerate

DBS - Diabase

Filling (VEIN-JOINT-FAULT) = FLNG.

Q - Quartz

F - Feldspar

G - Gouge

Water

Code 1 - The discontinuity is tight, water flow along it does not appear possible.

Code 2 - The discontinuity is dry with no evidence of water flow.

Code 3 - The discontinuity is dry with evidence of water flow, rust staining of discontinuity surface, etc.

Size or Length

The size of discontinuities is recorded in a coded format by estimating the largest extent in any direction and recording the appropriate size class as given below:

Code A - 0.6-2 m (2-6 ft)

Code B - 2-6 m (6-20 ft)

Code C - 6-20 m (20-60 ft)

Code D - >20 m (>60 ft)

Hardness (Hrdn.)*

R4 - Specimen requires more than one blow with hammer end of geological pick to fracture - 12000 psi (80 MPa).

R5 - Specimen requires many blows of hammer end of geological pick to fracture it - 3000 psi (200 MPa).

Units

Distances are measured in feet and inches.

Orientation of discontinuity data are measured in dip direction (azimuth).

Dip direction and dip in degree. Angle of declination at Stanleigh Mine area is 6½°W.

* Compressive strength is estimated by simple mechanical test with hammer and the description of hardness is mentioned above.

MAPPING SHEET

Card Type	Identification	Elevation	Dmn.	Formatn.	Level	Location
0,1,0,1	3603,XC			M,A,T		

Local Grid		Traverse				Nos.	Reference
Northing	Easting	Trend	Plunge	Length	Sc.	Obs.	Direction
25,61,60	53,02,5	155	± 0,0	50,0		27	

Remarks: 3603-XCUT, STANLEIGH MINE
LOWER FELT → PARTING [illegible] → MAIN REEF

DISCONTINUITY DATA

0,2 Card Type												Identification 3603,XC		
No.	Discontinuity Distance	Type	Dip/Dirn/Strike	Dip	Sc	Rough	Flats 1	Flats 2	Undul	Waves L	Waves A	Line Type	Line Pitch	Lithlgy.	Hrdn.
1	2,0	DV	0,1,0	6,2	V		7,1	2		1,7,4				D,B,S	R,4
2	1,0	JN	0,8,2	5,0	A			1		1,8,6				C,G,M	Y
3	2,0	JN	1,9,2	7,8	C			1		"				"	"
4	3,0	"	2,4,4	6,2	A			1		"				"	"
5	5,0	"	2,3,4	7,4	B			1		"				"	"
6	6,0	"	0,5,5	7,6	A		Dirty	1		"				"	"
7	7,0	DV	3,0,0	6,0	V		2,5	2		"		(S.T.)		D,B,S	"
8	8,0	JN	2,4,1	7,1	A					"				G,G,M	"
9		"	0,9,8	4,6	A			1		"				"	"
10		"	1,2,0	7,5	A			1		"				"	"
11	9,0	"	2,4,0	5,2	A					"				"	"
12	10,0	"	2,1,0	6,0	B			1		"				"	"
13	10,0	"	2,3,5	7,5	A			1		"				"	"
14		"	2,5,4	5,2	A			1		"				"	"
15		"	1,7,5	6,9	B			1		"				D,K,Z	"
16		"	1,8,2	6,6	C			2		1,7,8				"	"
17		"	1,9,0	6,6	B					1,8,0				"	"
18	12,0	"	0,6,2	6,9	A			1		"				"	"
19		"	1,9,4	6,9	C			1		"				"	"
20	13,0	"	0,3,5	1,5	A			1		"				"	"
21		"	3,2,5	9,0	B			1		"				"	"
22		"	0,1,1	6,0	A			1		"				"	"
23	14,0	"	0,6,2	5,4	A			1		"				"	"
24		"	1,2,8	6,4	A			1		"				"	"
25	16,0	"	0,9,0	1,6	A			1		"				"	"
26	17,0	"	0,6,8	7,2	A			1		"				"	"
27	18,0	"	0,2,2	1,2	A			1		"				C,G,M	"

MAPPING SHEET

Card Type	Identification	Elevation	Dec.	Formatn.	Level	Location
0,1,0,1	3,6,0,3, X,C	, , , ,	,	M,A,T	, , ,	, , ,

Local Grid		Traverse				Nos.	Reference
Northing	Easting	Trend	Plunge	Length	Sc.	Obs.	Direction
2,5,6,1,6,0	5,3,0,2,5	1,5,5	±,0,0	5,0,0		5,4	, , ,

Remarks: 3603 X CUT, STANLEIGH MINE
MAIN REEF → DIVIDEN QUARTZITE

DISCONTINUITY DATA

*,0,2 Card Type — Identification 3,6,0,3, X,C

No.	Discontinuity: Distance	Type	Dip direct. Strike	Dip	Sample	Flag 1	Flag 2	Waves	Line: Type	Line: Pitch	Lithlgy.	Hrdn.
2,8	, , , ,	J,N	0,4,8	0,6,	A		.	1 1,8,0	,	, , ,	C,G,M	R,4
2,9	, 1,9,0	"	0,1,5	3,0,	C		.	1 ,"	,	, , ,	, "	"
3,0	, 2,0,0	"	1,9,0	8,5,	A		.	1 ,"	,	, , ,	, "	"
3,1	, 2,1,0	"	0,2,7	0,6,	A		.	1 ,"	,	, , ,	, "	"
3,2	, , , ,	"	0,1,4	3,6,	B		.	1 ,"	,	, , ,	, "	"
3,3	, 2,2,0	"	1,9,2	6,2,	A		.	1 ,"	,	, , ,	, "	"
3,4	, 2,3,0	"	0,7,8	4,2,	A		.	1 ,"	,	, , ,	, "	"
3,5	, 2,4,0	"	0,5,5	6,4,	C		.	1 ,"	,	, , ,	, "	"
3,6	, , , ,	"	9,0,8	1,5,	A		.	1 ,"	,	, , ,	, "	"
3,7	, 2,5,0	"	1,2,0	8,0,	B		.	1 ,"	,	, , ,	, "	"
3,8	, , , ,	"	1,3,0	5,6,	A		.	1 ,"	,	, , ,	, "	"
3,9	, 2,6,0	"	1,3,0	8,2,	B		.	1 ,"	,	, , ,	, "	"
4,0	, 2,7,0	"	0,3,2	1,5,	A		.	1 ,"	,	, , ,	R,R,Z	"
4,1	, , , ,	,	0,6,2	8,4,	C		.	2 ,"	,	, , ,	, "	"
4,2	, , , ,	"	0,2,6	3,2,	B		.	1 ,"	,	, , ,	, "	"
4,3	2,8,0	"	1,9,8	9,0,	C		8,5	1 ,"	,	, , ,	, "	"
4,4	, 3,0,0	D,V	1,9,0	8,5,	D		8,5	2 1,7,2	(S.T.)	, , ,	D,S,S	"
4,5	, , , ,	J,N	1,8,3	8,6,	C		.	2 1,7,5	,	, , ,	D,R,Z	"
4,6	, 3,1,0	"	0,8,5	5,4,	A		.	1 1,8,0	,	, , ,	, "	"
4,7	, , , ,	"	1,1,0	5,6,	A		.	2 ,"	,	, , ,	, "	"
4,8	, , , ,	"	0,7,5	4,2,	D		.	1 ,"	,	, , ,	, "	"
4,9	, , , ,	"	1,1,5	8,5,	A		.	1 ,"	,	, , ,	, "	"
5,0	, 3,2,0	"	1,7,5	7,9,	B		.	1 ,"	,	, , ,	, "	"
5,1	, , , ,	"	1,7,4	1,8,	C		.	2 1,7,3	,	, , ,	, "	"
5,2	, , , ,	"	0,1,6	1,5,	B		.	1 1,8,0	,	, , ,	, "	"
5,3	, , , ,	"	1,8,8	8,2,	A		.	1 ,"	,	, , ,	, "	"
5,4	, 3,3,0	"	1,9,5	1,9,	C		.	1 ,"	,	, , ,	, "	"

MAPPING SHEET

Card Type	Identification	Elevation	Dmn.	Formatn.	Level	Location
0,1,0,1	36,03, X,C	, , , ,	,	M,A,T	, , ,	, , , ,

Local Grid		Traverse				Nos.	Reference
Northing	Easting	Trend	Plunge	Length	Sc.	Obs.	Direction
2,5,6,1,6,0	,5,3,0,2,5	1,55	±,0,0	5,0,0		1,1	, , ,

Remarks: 3603 X CUT, STANLEIGH MINE
DIVIDER QUARTZITE → UPPER REEF

DISCONTINUITY DATA

•,0,2 Card Type											Identification 36,03, X,C			
	Discontinuity						Flag.			Waves	Line		Lithlgy.	Hrdn.
No.	Distance	Type	Dip/dir. ~~Strike~~	Dip	Size	Shape	1	2	Weath.	I A	Type	Pitch		
5,5	, , , ,	J,N	1,0,5	1,9,	B		,		1	1,8,2	,	, ,	Q,R,Z	R4
6,6	, , , ,	"	1,8,9	1,9,	C		,		1	"	,	, ,	, ,	"
6,1	,3,4,0	"	1,8,5	2,0,	B		,		1	"	,	, ,	, ,	"
6,2	, , , ,	"	0,0,8	5,5,	C		.		2	1,7,8	,	, ,	, ,	"
6,3	, , , ,	"	2,1,5	8,5,	A		,			1,8,C	,	, ,	, ,	"
6,4	, , , ,	"	0,1,2	7,8,	A		.			"	,	, ,	, ,	"
6,5	,3,5,0	"	0,5,2	1,9,	B		,			"	,	, ,	, ,	"
6,6	, , , ,	"	0,1,5	1,9,	C		.			"	,	, ,	, ,	"
6,7	, , , ,	"	0,3,5	5,6,	A		.			"	,	, ,	, ,	"
6,4	, , , ,	"	0,3,6	5,5,	A		.			"	,	, ,	, ,	"
6,5	, , , ,	"	0,2,6	5,1,	C		,		2	1,7,8	,	, ,	, ,	"
6,6	,3,6,0	"	0,1,5	7,8,	A		,		1	1,8,C	,	, ,	, ,	"
6,7	, , , ,	"	0,4,2	7,6,	A		,		1	"	,	, ,	, ,	"
6,8	, , , ,	"	2,6,2	6,7,	A		,		1	"	,	, ,	, ,	"
6,9	,3,7,0	"	0,4,2	7,6,	A		,		1	"	,	, ,	, ,	"
7,0	, , , ,	"	0,1,2	5,4,	A		,		1	"	,	, ,	, ,	"
7,1	,3,8,0	"	1,8,5	1,9,	A		.		1	"	,	, ,	C,G,M	"
7,2	, , , ,	"	1,8,5	2,0,	A		,			"	,	, ,	, ,	"
7,3	, , , ,	"	1,8,3	1,8,	A		.			"	,	, ,	, ,	"
7,4	, , , ,	"	0,5,0	4,9,	C		,			"	,	, ,	, ,	"
7,5	,3,9,0	"	0,4,2	1,8,	A		.		1	"	,	, ,	, ,	"
7,6	, , , ,	"	0,5,4	1,6,	A		,		1	"	,	, ,	, ,	"
7,7	, , , ,	"	0,1,5	8,4,	C		Thick		1	"	,	, ,	, ,	"
7,8	,4,0,0	D,Y	0,1,4	8,6,	D		9,6'		1	1,7,6	(S,T)	, ,	D,B,S	"
7,9	, , , ,	J,N	1,6,0	3,5,	A		,			1,8,C	,	, ,	C,G,N	"
8,0	, , , ,	"	2,1,4	1,9,	C		.			"	,	, ,	, ,	"
8,1	, , , ,	"	0,4,5	9,2,	A		.			"	,	, ,	, ,	"

MAPPING SHEET

Card Type	Identification	Elevation	Dim.	Formatn.	Level	Location
0,1,0,1	3,6,0,3, X,C	, , , ,	,	M,A,T	, , ,	, , , ,

Local Grid		Traverse				Nos.	Reference
Northing	Easting	Trend	Plunge	Length	Sc.	Obs.	Direction
1,5,6,1,6,0	,5,3,0,2,5	1,5,5	±0,0	,5,0,0	1	0,5	, , ,

Remarks: 3603 XCUT, STANLEIGH MINE
UPPER RELF

DISCONTINUITY DATA

0,2 Card Type											Identification 36,03, X,C			
	Discontinuity				Size	Shape	Flng.		Waves	Line		Lthlgy.	Hrdn.
No.	Distance	Type	Dip direct. Strike	Dip			1	2	: L A	Type	Pitch		
8,2	, , , ,	J,N	0,2,5	2,7,	E		,		1	1,2,C	, ,	, ,	C,G,M	R,4
8,3	,4,1,0	T	0,3,5	1,5,	C		,		1	,,,	, ,	, ,	,,,	T
8,4	, , , ,	T	0,0,6	1,5,	B		,		2	1,7,9	, ,	, ,	,,,	T
8,5	, , , ,	T	0,1,0	8,1,	C		.		1	1,8,0	, ,	, ,	,,,	T
8,6	,4,2,0	T	0,5,6	1,2,	A		,		1	,,,	, ,	, ,	,,,	T
8,7	,4,3,0	T	0,2,0	9,2,	A		.		1	,,,	, ,	, ,	,,,	T
8,8	,4,4,0	T	0,5,5	5,7,	A		,		1	,,,	, ,	, ,	,,,	T
8,9	, , , ,	T	0,5,4	5,6,	B		,		1	,,,	, ,	, ,	,,,	T
9,0	, , , ,	T	0,5,6	5,7,	A		.		1	,,,	, ,	, ,	,,,	T
9,1	, , , ,	T	0,5,5	5,6,	A		.		1	,,,	, ,	, ,	,,,	T
9,2	, , , ,	T	0,1,4	8,0,	C		,		1	,,,	, ,	, ,	,,,	T
9,3	,4,5,0	T	0,4,5	8,5,	C		,		2	1,7,8	, ,	, ,	,,,	T
9,4	, , , ,	T	0,2,6	9,0,	C		,		2	1,8,0	, ,	, ,	,,,	T
9,5	,4,6,0	D,V	0,2,2	9,0,	D		,		2	1,7,7	, ,	, ,	D,B,S	T
9,6	, , , ,	J,N	0,2,1	8,2,	A		,		1	1,8,C	, ,	, ,	C,G,M	T
9,7	,4,7,0	T	0,1,8	1,9,	A		,		1	,,,	, ,	, ,	,,,	T
9,8	, , , ,	T	0,2,1	8,2,	B		,		1	,,,	, ,	, ,	,,,	T
9,9	,4,8,0	T	0,6,5	5,9,	A		,		1	,,,	, ,	, ,	,,,	T
0,0	, , , ,	,	0,4,7	3,0,	A		.		1	,,,	, ,	, ,	,,,	T
0,1	,4,9,0	,	3,5,2	7,8,	B		,		1	,,,	, ,	, ,	,,,	T
0,2	, , , ,	,	0,9,0	8,2,	A		.		1	,,,	, ,	, ,	,,,	T
0,3	, , , ,	,	0,3,0	7,9,	A		,		1	,,,	, ,	, ,	,,,	T
0,4	, , , ,	,	0,2,9	7,9,	A		,		1	,,,	, ,	, ,	,,,	T
0,5	,5,0,0	,	0,3,2	1,7,	E		.		1	,,,	, ,	, ,	,,,	T
,	, , , ,	,	, , ,	, , ,			,			, , ,	, ,	, ,	, , ,	,
,	, , , ,	,	, , ,	, , ,			,			, , ,	, ,	, ,	, , ,	,
,	, , , ,	,	, , ,	, , ,			,			, , ,	, ,	, ,	, , ,	,

MAPPING SHEET

Card Type	Identification	Elevation	Dom.	Formatn.	Level	Location
0,1,0,1	3,7,1,7, XC	, , , ,	,	M,A,T	, , ,	, , ,

Local Grid		Traverse				Nos.	Reference
Northing	Easting	Trend	Plunge	Length	Sc.	Obs.	Direction
2,6,7,2,0	5,3,2,8,0	0,4,5	-0,8	2,2,0		2,7	, , ,

Remarks: 3717 X CUT, STANLEIGH MINE
UPPER REEF

DISCONTINUITY DATA

*,0,2 Card Type											Identification 3,7,1,7, XC			
	Discontinuity				Size	Shape	Flng.		Strength	Waves	Line		Lthlgy.	Hrdn.
No.	Distance	Type	Strike	Dip			1	2		T L A	Type	Pitch		
0,1	,,0,0	J,N	1,1,4	6,5	A		.		1	1,8,0	,	, ,	C,G,M	R,4
0,2	,,1,0	,	3,1,0	5,9	A		.		1	,~,	,	, ,	~	~
0,3	,,2,0	,	0,1,5	8,0	C		,		1	1,7,8	,	, ,	~	~
0,4	, , ,	,	0,1,4	7,6	A		.		1	1,8,0	,	, ,	~	~
0,5	, , ,	,	1,7,0	1,9	A		.		1	,~,	,	, ,	~	~
0,6	, , ,	,	1,1,6	2,4	B		.		1	,~,	,	, ,	~	~
0,7	,,3,0	,	0,1,1	7,1	A		,		1	,~,	,	, ,	~	~
0,8	, , ,	,	0,1,2	7,0	B		.		1	,~,	,	, ,	~	~
0,9	, , ,	,	0,1,1	7,2	A		.		1	,~,	,	, ,	~	~
1,0	, , ,	,	1,2,0	~,5	A		.		1	,~,	,	, ,	~	~
1,1	, , ,	,	0,4,0	8,8	A		,		1	,~,	,	, ,	~	~
1,2	, , ,	,	0,4,2	~,6	A		,		1	,~,	,	, ,	~	~
1,3	, , ,	,	0,0,8	7,5	A		,		1	,~,	,	, ,	~	~
1,4	,,4,0	,	3,1,5	2,5	A		,		1	,~,	,	, ,	~	~
1,5	, , ,	,	0,8,6	1,2	A		,		1	,~,	,	, ,	~	~
1,6	, , ,	,	0,4,2	8,5	C		,		2	1,7,8	,	, ,	~	~
1,7	, , ,	,	0,3,2	8,8	A		.		1	1,8,0	,	, ,	~	~
1,8	,,5,0	,	0,1,0	8,1	B		,		2	,~,	,	, ,	~	~
1,9	, , ,	,	0,2,1	1,9	A		.		1	,~,	,	, ,	~	~
2,0	, , ,	,	1,1,0	6,5	A		,		1	,~,	,	, ,	~	~
2,1	, , ,	,	0,3,2	8,5	A		,		1	,~,	,	, ,	~	~
2,2	, , ,	,	0,2,0	6,6	A		,		1	,~,	,	, ,	~	~
2,3	,,6,0	,	0,1,8	8,9	A		,		1	,~,	,	, ,	~	~
2,4	, , ,	,	0,1,2	7,2	C		.		2	1,7,7	,	, ,	~	~
2,5	, , ,	,	3,0,2	0,5	B		,		1	1,7,9	,	, ,	~	~
2,6	, , ,	,	1,0,8	1,5	B		,		1	1,8,0	,	, ,	~	~
2,7	,,7,0	,	0,1,1	7,6	C		.		1	,~,	,	, ,	~	~

MAPPING SHEET

Card Type	Identification	Elevation	Dec.	Formatn.	Level	Location
0,1,0,1	3,7,1,7, XC	, , , ,	,	H,A,T	, , ,	, , , ,

Local Grid		Traverse				Nos.	Reference
Northing	Easting	Trend	Plunge	Length	Sc.	Obs.	Direction
,2,6,7,2,0	,5,3,2,8,0	0,4,5	-,0,8	,2,2,0		5,2	, , ,

Remarks: 3717 X CUT, STANLEIGH MINE
MAR REEF

DISCONTINUITY DATA

,0,2 Card Type											Identification 3,7,1,7, XC			
	Discontinuity						Flag			Waves	Line			
No.	Distance	Type	Dip direction / Strike	Dip	Size	Shape	1	2	Quality	L	A	Type	Pitch	Lithlgy.	Hrdn.
2,8	, , , ,	JN	0,2,4	7,9,	C				1	1,8,0		,	, ,	C,G,M	R,4
2,9	, , , ,	Y	1,1,0	7,6,	A				1	,"		,	, ,	,"	"
3,0	, ,80	Y	0,1,5	7,5,	A				1	"		,	, ,	,"	"
3,1	, , , ,	Y	1,1,5	7,6,	A				1	"		,	, ,	,"	"
3,2	, , , ,	Y	0,1,6	7,4,	B				1	"		,	, ,	,"	"
3,3	,9,0	Y	0,7,0	3,5,	A				1	"		,	, ,	,"	"
3,4	,1,0,0	Y	0,1,4	9,0,	C				1	"		,	, ,	,"	"
3,5	,1,2,0	Y	0,4,5	9,0,	A				1	1,7,8		,	, ,	,"	"
3,6	, , , ,	Y	0,1,0	8,0,	C				1	1,8,0		,	, ,	,"	"
3,7	,1,3,0	Y	0,0,8	8,9,	B				1	"		,	, ,	,"	"
3,8	,1,4,0	Y	0,1,0	7,9,	A				2	"		,	, ,	,"	"
3,9	, , , ,	Y	0,0,0	8,8,	A				1	"		,	, ,	,"	"
4,0	,1,5,0	Y	0,1,1	9,0,	B				1	"		,	, ,	,"	"
4,1	, , , ,	Y	0,2,2	0,0,	A				1	"		,	, ,	,"	"
4,2	, , , ,	Y	0,7,2	1,5,	C				1	"		,	, ,	,"	"
4,3	, , , ,	Y	0,2,8	1,9,	A				1	"		,	, ,	,"	"
4,4	,1,6,0	Y	0,1,8	7,6,	A				1	"		,	, ,	,"	"
4,5	, , , ,	Y	2,1,2	1,4,	A				1	"		,	, ,	,"	"
4,6	,1,7,0	Y	0,1,5	8,1,	A				1	"		,	, ,	,"	"
4,7	, , , ,	Y	0,1,4	8,6,	A				1	"		,	, ,	,"	"
4,8	,1,8,0	Y	3,4,4	9,0,	B				1	"		,	, ,	,"	"
4,9	,1,9,0	Y	0,1,7	8,0,	A				1	"		,	, ,	,"	"
5,0	,2,0,0	Y	0,1,8	7,7,	C				2	1,7,7		,	, ,	,"	"
5,1	, , , ,	Y	0,0,8	7,2,	A				1	1,8,0		,	, ,	,"	"
5,2	,2,2,0	Y	1,2,0	6,0,	A				1	"		,	, ,	,"	"
, , ,	, , , ,	, , ,	, , , ,	, , ,	, ,		,	,	,	, , ,		, ,	, , ,	, , ,	, ,
, , ,	, , , ,	, , ,	, , , ,	, , ,	, ,		,	,	,	, , ,		, ,	, , ,	, , ,	, ,

MAPPING SHEET

Card Type	Identification	Elevation	Dsn.	Formatn.	Level	Location
0,1,0,1	3,7,0,5,1,I,D			M,H,T.		

Local Grid		Traverse				Nos.	Reference
Northing	Easting	Trend	Plunge	Length	Sc.	Obs.	Direction
2,6,7,2,0	5,3,2,8,0	1,6,3	0,0,8	5,2,0		2,7	

Remarks: 37051 - INTAKE DECLINE, STANLEIGH MINE
MAIN REEF

DISCONTINUITY DATA

*,0,2 Card Type												Identification 3,7,0,5,1,I,D			
	Discontinuity						Clng.		Waves	Line					
No.	Distance	Type	Dip direc. Strike	Dip	Size	Shape	1	2	Water	: L A	Type	Pitch	Lithlgy.	Hrdn.
1	0	J,N	0,2,4	7,4,	B				1	1,8,0			C,G,M	R,4
2		J,N	0,2,5	7,5,	C				1	"			"	"
3		T	0,3,4	7,5,	B				1	"			"	"
4		T	1,8,2	6,0,	A				1	"			"	"
5		T	0,3,1	9,0,	A				1	"			"	"
6		T	1,8,0	4,0,	B				1	"			"	"
7		T	0,3,0	9,0,	A				1	"			"	"
8		T	1,8,5	7,7,	A				1	"			"	"
9	1,0	T	0,7,8	3,2,	B				1	"			"	"
10		T	0,3,9	8,8,	C				1	"			"	"
11		T	0,2,9	8,6,	A				1	"			"	"
12	2,0	T	0,3,0	9,0,	B				1	"			"	"
13	3,0	T	0,2,9	9,0,	B				1	"			"	"
14	4,0	T	9,7,1	7,6,	A				1	"			"	"
15		T	2,0,3	8,5,	C				1	"			"	"
16	5,0	T	1,9,2	7,8,	B				1	"			"	"
17		T	1,9,0	7,7,	B				2	1,7,2			"	"
18		T	1,8,9	7,8,	C				1	1,8,2			"	"
19		T	2,0,0	2,2,	A				1	"			"	"
20	6,0	T	1,8,7	7,1,	B				1	"			"	"
21		T	2,3,6	2,8,	C				1	"			"	"
22		T	1,8,6	7,2,	A				1	"			"	"
23		T	1,8,5	7,5,	A				1	"			"	"
24		T	1,9,0	7,6,	B				1	"			"	"
25		T	1,9,2	7,7,	B				1	"			"	"
26	7,0	T	1,8,4	7,6,	A				1	"			"	"
27	7,6	T	0,1,1	6,0,	A				1	"			"	"

MAPPING SHEET

Card Type	Identification	Elevation	Dsn.	Formatn.	Level	Location
0,1,0,1	3,7,0,5,1,J,D			M.A.I.		

Local Grid		Traverse				Nos.	Reference
Northing	Easting	Trend	Plunge	Length	Sc.	Obs.	Direction
26,720	53,280	166	008	520		54	

Remarks: 37051 INTAKE DECLINE, STANLEIGH MINE MAIN REEF

DISCONTINUITY DATA

*,0,2 Card Type — Identification 3,7,0,5,1,J,D

No.	Discontinuity: Distance	Type	Dip/Dirn. Strike	Dip	Size	Shape	Filling 1	Filling 2	Waviness	Waves: L	Waves: A	Lithe: Type	Lithe: Pitch	Lthlgy.	Hrdn.
2,8		J,N	0,6,4	7,6,	A				1	1,8,0				C,G,M	R4
2,9	,9,0	"	2,2,2	9,0,	A				1	"				"	"
3,0	,10,0	"	2,3,0	9,2,	B				1	"				"	"
3,1	,11,0	"	2,1,0	8,0,	B				1	"				"	"
3,2		"	2,0,4	8,5,	B				1	"				"	"
3,3	,12,0	"	0,3,5	8,8,	A				1	"				"	"
3,4	,13,0	F	9,1,6	2,8,	C				2	"				"	"
3,5	,14,0	"	0,3,2	7,2,	B				1	"				"	"
3,6	,15,0	"	0,1,4	3,5,	B				1	1,7,8				"	"
3,7	,16,0	"	0,3,5	4,4,	A				1	1,8,0				"	"
3,8	,17,0	"	1,9,5	7,9,	A				1	"				"	"
3,9	,18,0	"	1,7,8	8,8,	A		THICK		1	"				"	"
4,0		D,K	1,8,5	8,5,	D		8,7		2	1,7,6	(3,T)			D,B,S	"
4,1	,20,0	J,N	1,8,8	8,2,	B				2	1,7,8				G,G,M	"
4,2		"	1,9,0	7,4,	C				1	1,8,0				"	"
4,3		F	0,1,2	6,8,	B				1	"				"	"
4,4		F	9,0,4	8,2,	A				1	"				"	"
4,5	,21,0	F	0,5,5	32,	B				1	"				"	"
4,6		F	0,0,7	84,	B				1	"				"	"
4,7	,23,0	F	0,4,9	65,	A				1	"				"	"
4,8		"	0,6,9	5,5,	A				1	"				"	"
4,9	,24,0	"	9,0,8	82,	B				2	"				"	"
5,0		F	0,0,0	3,5,	B				1	"				"	"
5,1	,25,0	F	0,7,4	30,	A				1	"				"	"
5,2		F	0,2,0	40,	C				1	"				C,G,M	"
5,3	,26,0	F	2,3,2	5,1,	A				1	"				"	"
5,4	,27,0	F	0,5,2	50,	A				1	"				C,G,M	"

MAPPING SHEET

Card Type	Identification	Elevation	Conn.	Formatn.	Level	Location
0,1,0,1	3,7,0,5,1,1,D	, , , ,	,	M,A,T	, , ,	, , ,

Local Grid		Traverse				Nos.	Reference
Northing	Easting	Trend	Plunge	Length	Sc.	Obs.	Direction
2,6,7,2,0	5,3,2,2,0	1,6,0	0,5,8	,5,2,6		8,1	, , ,

Remarks: 37051, NITINAT DE CLIFF, STANLEIGH MINE

DISCONTINUITY DATA

0,2 Card Type										Identification 3,7,0,5,1,1,D			
	Discontinuity					Flag.			Waves	Line			
No.	Distance	Type	Direct. Strike	Dip	Size	1	2	Roughness	1 A	Type	Pitch	Lithlgy.	Hrdn.
5,3	, , , ,	JN	2,3,5	7,8,	A		,	1	1,7,0	,	, ,	C,G,M	R,4
5,6	, , , ,	"	2,4,0	8,2,	C		,	1	, "	,	, ,	, "	"
5,7	, , , ,	"	2,3,7	7,2,	B		,	1	, "	,	, ,	, "	"
5,8	, , , ,	"	1,7,2	3,4,	B		,	1	, "	,	, ,	, "	"
5,9	, , , ,	"	2,0,4	8,5,	C		,	1	, "	,	, ,	, "	"
6,0	2,8,0	T	2,2,4	9,0,	B		,	1	, "	,	, ,	, "	"
6,1	, , , ,	T	2,3,5	6,2,	B		,	1	, "	,	, ,	, "	"
6,2	, , , ,	"	0,7,2	2,6,	B		,	1	1,7,7	,	, ,	, "	"
6,3	2,9,0	,	2,7,4	3,1,	B	Thick.	,	1	1,8,0	,	, ,	, "	"
6,4	, , , ,	DY	9,1,2	8,2,	D	1,5	,	2	1,7,5	,	, ,	D,B,S	,
6,5	, , , ,	JN	2,1,5	6,4,	B	,	,	1	1,8,0	,	, ,	C,G,M	,
6,6	3,0,0	"	0,1,2	8,4,	A	,	,	1	, "	,	, ,	, "	,
6,7	, , , ,	DY	9,0,2	8,2,	D	,	,	2	, "	,	, ,	D,B,S	,
6,8	3,1,0	JN	9,3,5	3,0,	B	,	,	1	, "	,	, ,	C,G,M	"
6,9	3,2,0	"	3,5,2	9,0,	B	,	,	1	, "	,	, ,	, "	"
7,0	, , , ,	,	0,1,5	1,8,	A	,	,	1	, "	,	, ,	, "	"
7,1	3,3,0	DY	0,1,2	2,5,	D	,	,	2	1,7,6	,	, ,	D,P,	"
7,2	, , , ,	JN	2,1,2	7,0,	C	,	,	1	1,8,0	,	, ,	C,G,M	"
7,3	3,4,0	"	0,5,6	4,2,	B	,	,	2	1,7,2	,	, ,	, "	"
7,4	, , , ,	"	0,1,6	7,2,	B	,	,	1	1,8,0	,	, ,	, "	"
7,5	, , , ,	"	0,7,2	7,2,	A	,	,	1	, "	,	, ,	, "	"
7,6	, , , ,	"	0,0,8	7,6,	B	,	,	1	, "	,	, ,	, "	"
7,7	, , , ,	"	9,0,4	8,5,	H	,	,	1	, "	,	, ,	, "	"
7,8	3,5,0	"	3,5,2	8,5,	B	,	,	1	, "	,	, ,	, "	"
7,9	, , , ,	,	0,5,6	3,9,	A	,	,	1	, "	,	, ,	, "	"
8,0	, , , ,	,	0,4,5	6,5,	A	,	,	1	, "	,	, ,	, "	"
8,1	, , , ,		0,6,7	7,2,	H	,	,	1	, "	,	, ,	, "	"

MAPPING SHEET

Card Type	Identification	Elevation	Dmn.	Formatn.	Level	Location
0,1,0,1	3,7,0,5,1,I,D					

Local Grid		Traverse				Nos.	Reference
Northing	Easting	Trend	Plunge	Length	Sc.	Obs.	Direction
7,6,7,2,0	5,3,2,8,0	1,6,0	0,0,8	5,2,0		108	

Remarks: 37051 INTAKE DECLINE, STANLEIGH MINE

DISCONTINUITY DATA

*,0,2 Card Type												Identification 3,7,0,5,1,I,D	
	Discontinuity						Flag			Caves	Line		Lthlgy.	Hrdn.
No.	Distance	Type	Dip direct. Strike	Dip	Size	Shape	1	2	Water	L A	Type	Pitch		
8,2	3,6,0	J,N	2,4,0	6,2,	E				1	1,2,0			Q,R,Z	R4
8,3		X	2,3,5	8,4,	B				1					
8,4		X	0,5,2	3,6,	C				1					
8,5		X	0,1,5	9,0,	B				1					
8,6		X	0,3,9	4,9,	B				1					
2,2		X	0,0,4	7,2,	B				2	1,7,7			Q,R,Z	
2,2	3,7,0	X	0,2,2	5,8,	A				1	1,2,0			C,G,M	
		X	0,4,5	4,0,	A				1					
		X	0,0,8	8,9,	C				1					
9,1		X	0,9,0	3,5,	A				1					
9,2		X	0,0,8	8,0,	E				2					
9,3		X	0,0,4	8,0,	A				1					
4,4		X	0,5,0	7,4,	C				1				C,G,M	
2,5	3,8,0	X	3,4,0	5,4,	A				1				Q,R,Z	
9,6		X	0,9,5	7,0,	B				1				C,G,M	
9,7		X	0,0,3	7,2,	C				1					
9,8		X	0,2,0	7,9,	B				1					
9,9		X	0,0,9	7,4,	B				2					
1 0,0	3,9,0	X	0,1,0	7,2,	B				1					
0,1		X	0,0,4	7,2,	B				2				Q,R,Z	
0,2		X	3,5,5	7,8,	B				1					
0,3	4,0,0	X	3,5,6	7,4,	B				1					
0,4		X	0,2,7	7,1,	B				1				C,G,M	
2,6		X	2,5,0	5,5,	A				1				Q,R,Z	
0,6		X	0,4,3	7,6,	B				2				Q,R,Z	
2,7		X	0,2,2	7,8,	C				1					
1 0,8	4,1,0	X	3,1,0	7,2,	A				1				C,G,M	

MAPPING SHEET

Card Type	Identification	Elevation	Dim.	Formatn.	Level	Location
0,1,0,1	3,7,0,5,1,1,D			M,A,I		

Local Grid		Traverse				Nos.	Reference
Northing	Easting	Trend	Plunge	Length	Sc.	Obs.	Direction
2,6,1,2,0	5,3,2,8,0	1,6,0	−0,3	5,2,0		135	

Remarks: 37051 INTAKE DECLINE, STANLEIGH MINE

DISCONTINUITY DATA

0,2 Card Type — Identification 3,7,0,5,1,1,D

No.	Discontinuity: Distance	Type	Dipdirect/Strike	Dip	Size	Disp.	Flng. 1	Flng. 2	Waviness	Waves: L	Waves: A	Line: Type	Line: Pitch	Lthlgy.	Hrdn.
1 0,9		JW	0,7,6	6,6,	B		.		1	1,9,0				C,G,M	R4
1,0		X	3,2,3	4,1,	B		.		1	"				"	X
1,1		X	3,0,4	7,1,	C		.		1	"				"	X
1,2		X	0,2,9	7,6,	B		.		1	"				C,G,M	X
1,3	4,2,0	X	0,4,0	7,8,	B		.		2	"				"	X
1,4		X	2,6,5	7,9,	B		.		1	"				"	X
1,5		X	2,5,4	8,4,	B		.		1	"				"	X
1,6		X	0,2,0	7,2,	B		.		1	"				C,G,M	X
1,7	4,4,0	X	0,2,9	7,8,	C		.		1	"				"	X
1,8		X	0,3,0	7,6,	B		.		1	"				C,G,M	X
1,9		X	1,6,5	9,0,	B		.		1	"				"	X
2,0	4,6,0	X	0,2,5	7,6,	B		.		1	"				C,G,M	X
2,1		X	2,1,5	9,0,	C		.		2	1,7,5				"	X
2,2		X	2,7,5	9,0,	C		.		2	1,8,0				C,G,M	X
2,3		X	2,4,2	8,4,	B		.		1	"				"	X
2,4	4,8,0	X	1,8,5	4,3,	B		.		1	"				"	X
2,5		X	2,3,2	6,1,	B		.		1	"				C,G,M	X
2,6		X	0,3,1	6,8,	B		.		1	"				"	X
2,7	4,9,0	X	0,0,4	7,5,	B		.		1	"				C,G,M	X
2,8		X	0,3,4	9,0,	A		.		1	"				"	X
2,9		X	0,3,0	8,2,	B		.		2	1,7,7				C,G,M	X
3,0		X	2,5,5	7,6,	B		.		1	1,8,0				C,G,M	X
3,1		X	0,6,7	8,0,	B		.		1	"				"	X
3,2	5,0,0	X	0,6,2	8,6,	B		.		1	"				"	X
3,3		X	0,2,0	9,0,	B		.		1	"				"	X
3,4		X	0,0,8	8,0,	C		.		1	"				C,G,M	X
3,5	5,1,0	X	2,7,3	6,5,	B		.		1	"				C,G,M	X

MAPPING SHEET

Card Type	Identification	Elevation	Dsn.	Formatn.	Level	Location
0,1,0,1	3,7,0,5,1,J,0	, , , ,	,	MAT	, , ,	, , ,

Local Grid		Traverse				Nos.	Reference
Northing	Easting	Trend	Plunge	Length	Sc.	Obs.	Direction
2,6,7,2,0	5,3,2,8,0	1,6,0	0,0,8	5,2,0		139	, , ,

Remarks: 37051 INTAKE DECLINE, STANLEIGH MINE

DISCONTINUITY DATA

•,0,2 Card Type — Identification 3,7,0,5,1,J,0

	No.	Discontinuity: Distance	Type	Dip/Dir. Strike	Dip	Sur.	Wav.	Flng. 1	Flng. 2	Suit.	Waves: I L A	Line: Type	Line: Pitch	Lthlgy.	Hrdn.
1	3,6	, , , ,	JN	2,8,0	7,4	C		,		1	1,2,0	,	, ,	CEM	R4
1	3,7	, , , ,	JN	0,8,1	8,8	E		,		1	, ✓ ,	,	, ,	~	1
1	3,8	, , , ,	Y	0,8,3	8,7	E		,		1	, ✓ ,	,	, ,	~	~
1	3,9	5,2,0	Y	0,8,0	8,8	E		,		1	, ~ ,	,	, ,	~	1
	,	, , , ,	BG	0,2,5	1,3			1			, , ,	,	, ,	,	,
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